Advancing Resource Management at Shattuck Hospital (Jamaica Plain, MA)

1. OVERVIEW

The Lemuel Shattuck Hospital (henceforth "Shattuck"), located in Jamaica Plain, Massachusetts, is the primary provider of outpatient and inpatient services for the Massachusetts Department of Public Health in the Metro-Boston area. In addition, this fully accredited teaching facility provides a wide array of quality mental health, substance abuse, and human services. Shattuck's "one-stop health care" approach is the result of a public-private collaborative between Tufts University School of Medicine, the Department of Mental Health, the Department of Public Health, the Division of Medical Assistance and local community health centers. The hospital has 278 inpatient beds, and an additional 100 beds in its detoxification and AIDS treatment programs. There is also a secure 20-bed inpatient correctional unit.

2. BASELINE SOLID WASTE AND RECYCLING SERVICES AND LEVELS

A single disposal contractor provides Shattuck's container/compactor, hauling, and disposal needs. Shattuck's trash infrastructure consists of two-containers: its 35-yard unit with compactor is serviced on a regular three-times-a-week schedule, while its 40-yard open container is serviced on a "call" basis as its capacity is reached. The 35-yard compactor handles approximately 83% of Shattuck's annual trash tonnage, an estimated 820 tons in 2000.[1] Composition of waste disposed using the 35-yard container includes paper, corrugated cardboard, organics (e.g., food, textiles, wood, and excluding hazardous and medical waste), plastics and other materials. Approximately 167 tons of waste (17% of total) was disposed in the 40-yard container in 2000. This container is used for more periodic waste, consisting of construction and demolition debris, scrap wood and pallets, old furniture, and other bulk items. Each operating unit at Shattuck is responsible for consolidating its trash in one of several central areas throughout the hospital. Trash is collected daily by Shattuck custodial staff, and transported to one of the two contractor-leased containers.

There are two contracted services to accommodate the Shattuck recycling program's current focus on recovering mixed paper. In the first service, ten Shattuck-owned 96-gallon totes are distributed throughout the building for mixed paper recycling (generally limited to higher grade white and mixed paper). These are collected as needed by Shattuck custodial staff, and brought to the loading dock for pick-up by the recycling contractor[2] on a "call" basis. Approximately 4 tons of paper (50% of total recycling) was recycled using this service in 2000.

Another contractor provides shredding and recycling service for confidential patient records. Contractor-provided secure bins are brought to the loading dock every two

[1] Estimates based on August 2000 invoice. Shattuck management indicated a fairly consistent tonnage from month to month.
[2] A sub-contractor that provides this service under the auspices of the trash contractor.

weeks by Shattuck custodial staff for on-site shredding, hauling, and recycling by this contractor. It was noted that the service might be switched to a "call" basis as paper volumes are determined in the coming months. This service recycled approximately 4 tons in 2000. Thus, in total, an estimated 8 tons of paper was recycled through both the shredded and mixed paper services. This represents less than 1% of all trash disposed in 2000 (987 tons).

Corrugated cardboard was at one time recycled (approximately 2-3 tons per month), but organics contamination created a problem and the program was discontinued. Shattuck is interested in reintroducing a corrugated cardboard recycling program. Of other conspicuous materials, wood pallets are currently given away, occasionally reused, or disposed. In addition, there is no formal program for glass/aluminum/plastic container recycling. Shattuck does use other services to dispose of medical and hazardous waste and recycle batteries, fluorescent lamps, and electronics. These services are beyond the scope of this analysis, which will focus primarily on fibre and organics diversion.

3. BASELINE CONTRACTS AND COMPENSATION

Shattuck has contracts for its trash, mixed paper, and shredding services, which have important implications for cost and service levels (Table 1). The internal costs of labor to transport trash and recyclables were not identified and are beyond the scope of this study, but represent another potential issue for assessing overall program efficiency.

Under its current trash contract, Shattuck pays a volume-based haul fee of $90 for the 35-yard container, and $115 for the 40-yard container. A landfill tipping fee of $55 per ton is also applied to all trash managed, along with a $75 and $175 charge per month for rental of the 40-yard container and 35-yard compactor, respectively. Shattuck paid an estimated $76,000 in 2000 on the trash contract on 987 tons managed, an average of $78 per ton.

Table 1: Trash/Recycling Cost Summary for Shattuck Hospital, 2000

Contract	Payment Structure	CY2000 Contract Cost	Tons Managed	Cost per Ton
Trash	Volume-based haul fee ($90 for 34-yd container, $115 for 40-yd container)	$19,260	987	$78
	Landfill tipping fee ($55 ton)	$54,305		
	Container rental ($250/mo)	$3,000		
	Total	**$76,565**		
Mixed Paper (mid- to high grade paper)	No charge, no revenue	$0	~4	$0
Shredded Paper (confidential patient documents)	$3/minute shredding fee, no charge, no revenue on paper	Started late 2000, ~$250/month, projected $3000/year	~4	~$750
	Totals	**$79,565**	**995**	

Two separate contracts cover Shattuck's fibre recycling services. For its mixed paper recycling, the contractor picks up the paper from loading dock when called, and neither charges for the service, nor pays a portion of market value to Shattuck for this paper. For the shredded paper program, Shattuck is charged $3 per minute for shredding, which normally takes 20-30 minutes to complete for a typical pick-up. Costs for this service averaged $250 per month for the last several months of FY2001. There are no associated hauling charges or revenues from commodity value.

4. OPPORTUNITIES FOR COST SAVINGS AND ENHANCED RECYCLING SERVICES

Restructuring and further coordinating its contracts and recycling programs to be consistent with RM practices presents an opportunity for Shattuck to achieve higher diversion rates while maintaining or decreasing waste hauling, disposal, and recycling costs. RM might also minimize Shattuck's management time and expense on waste, recovery, and contract coordination issues.

To assess recycling opportunities under an RM contract, Shattuck waste stream composition was estimated based on hospital waste stream profiles developed by the California Integrated Waste Management Board (Table 2). Tables 3 and 4 present three scenarios projecting incremental improvements from Shattuck baseline recovery rates for paper and cardboard, which are readily recyclable materials. Current contract costs can be used as a basis to estimate the expected net cost or savings as a result of increased diversion under an RM contract. The emphasis in these scenarios is on capturing the "low-hanging fruit" by increasing paper and corrugated cardboard capture rates.

Table 2: Shattuck Post-Recycling Waste Stream Fibre Composition Assumptions

Material	Waste Composition	Estimated Tonnage in Shattuck Trash
Paper	**53.8%**	**531.2**
Mixed Paper	30.4%	300.2
Cardboard	10.4%	102.7
High-grade paper	6.3%	62.2
Other (Newspaper, kraft paper)	6.7%	66.2
Plastic	**14.6%**	**144.2**
Redeemable	0.1%	1.0
Film	5.3%	52.3
HDPE containers	2.7%	26.7
Other recyclable plastics	6.5%	64.2
Glass	**1.8%**	**17.8**
Metals	**2.6%**	**25.7**
Organics (yard waste, food, etc.)	**19.2%**	**189.6**
Other waste (grit, diapers, household hazardous waste, inert solids)	**8.0%**	**79.0**
Total	100.0%	987.4

* Conservative estimates based on California Integrated Waste Management Board Waste data (http://www.ciwmb.ca.gov/BizWaste/Factsheets/Hospital.htm).

Table 2 shows that there are significant amounts of readily recyclable materials currently being disposed of as waste at Shattuck, despite more economical recycling options (see Table 3). Jointly, avoided disposal costs and potential recycling revenues exceed the added expense that could be expected to result from higher levels of recycling service (Tables 3 and 4). The most aggressive scenario (#3) represents an increase in the net recycle rate from 1% to 45% (Table 4). Avoided landfill tip fees represent the largest portion of the total cost savings from this increased diversion (86% in scenario 3).

Table 3: Effects of Increased Fibre Recycling on Shattuck Contract Costs

Material	Scenario Name	Capture Rate of Material (1)	Tonnage of Material Recovered	Avoided Landfill Tip Fee (2)	Avoided Hauling Cost (3)	Revenue (4)	Total Savings
Mixed Paper	Current	2.2%	8	$438	$78	$16	$532
	Scenario 1	8.0%	29	$1,594	$282	$59	$1,936
	Scenario 2	25.0%	91	$4,982	$882	$186	$6,050
	Scenario 3	50.0%	181	$9,965	$1,764	$371	$12,100
Cardboard	Current	0.0%	0	$0	$0	$0	$0
	Scenario 1	15.0%	15	$997	$150	$32	$1,179
	Scenario 2	35.0%	36	$2,327	$350	$74	$2,750
	Scenario 3	60.0%	62	$3,989	$600	$126	$4,715
Plastics	Current	0.0%	0	$0	$0	NA	$0
	Scenario 1	15.0%	22	$1,400	$211	NA	$1,610
	Scenario 2	35.0%	50	$3,266	$491	NA	$3,757
	Scenario 3	60.0%	86	$5,599	$842	NA	$6,441
Organics	Current	0.0%	0	$0	$0	NA	$0
	Scenario 1	15.0%	28	$1,841	$277	NA	$2,118
	Scenario 2	35.0%	66	$4,295	$646	NA	$4,941
	Scenario 3	60.0%	114	$7,363	$1,107	NA	$8,471

(1) Scenarios were developed based on capture rates for different materials within the different types of organizations, thus capture rates vary by organization. Incremental gains for a material with a relatively high capture rate in one organization would be more modest than for organizations with lower capture rates of the same material. Readily available sector based waste composition data was used to estimate the capture rates. When actual waste composition data was not available California Integrated Waste Management Board standards were used. Scenarios were calculated showing incremental gains for each chosen material. Materials such as paper, cardboard, glass, plastics and organics with readily available secondary markets were chosen.

(2) Estimated on August 2000 invoice landfill tip fee of $55/ton.

(3) These are estimated assuming 50% variable costs and a weighted average pick-up fee of $94.25 and average of 4.84 tons per pick-up.

(4) Assumes a conservative $2.05 per ton rate for mixed paper and cardboard based on experience with other Massachusetts organizations.

Table 4: Summary of Potential Shattuck Contract Cost Savings

Scenario	Tonnage Material Recovered	Avoided Landfill Tip Fee	Avoided Hauling Cost	Revenue	Total Savings	Total Savings from Baseline	Savings as % of Total Contract Costs	Resulting Net Recycle Rate
Current	8	$438	$78	$16	$532	NA	NA	<1%
Scenario 1	94	$5,832	$920	$91	$6,843	$6,310	7.9%	9.5%
Scenario 2	243	$14,871	$2,369	$259	$17,499	$16,967	21.3%	24.4%
Scenario 3	443	$26,916	$4,314	$498	$31,727	$31,195	39.2%	44.5%

The scenarios suggest potential cost savings of between $6,310 and nearly $31,200, representing between 8% and 39% of the affected service base of approximately $79,500 for relevant trash and recycling services. These savings represent estimates of "gain-sharing" that may be distributed in part or entirely to the contactor as part of a restructured compensation package to provide direct financial incentives for resource efficiency, and/or to fund internal recycling and source reduction initiatives. This analysis does not take into consideration potential cost savings from optimizing the shredding program (est. $750 per month or $9000 per year) because it is a required service that handles modest but consistent volumes of confidential information.

A study of waste prevention in the hospital context suggests waste disposal and recycling savings of the type described above account for only about one-third of total potential savings. The much larger source of savings stems from waste prevention – savings resulting primarily from effort to decrease expenditures for disposable supplies procurement and associated inventory carrying costs. For example, the New York City Department of Sanitation estimates that a l,000-bed hospital switching from disposable to reusable food service items would achieve waste prevention of 200 tons per year and savings of $500,000 per year.[3]

As indicated in the above scenarios, Shattuck and its RM contractor might choose to focus initially on improving fibre capture rates, since paper is the largest waste stream component (especially mixed paper, high-grade paper, corrugated cardboard, and newspapers). Other large components that may be secondary objectives include plastics, food waste, and disposable linens (a combination of paper and other materials). The following are suggestions for achieving higher recycle rates and contract cost savings:

- *Increase the number of paper recycle containers and make them more conspicuous and accessible, while limiting the number of trash bins and contractor hauling.* This would make recycling more convenient and increase paper diversion by having custodial staff collect paper recyclables at more numerous recycle bins dispersed throughout the hospital. Mixed paper diversion is likely not optimized because it relies on employees to actively seek one of only a dozen or so recycle containers. In tandem, trash receptacles should be limited, within reason, to make it easier to recycle than throw materials in the trash.

[3] http://www.ciwmb.ca.gov/BizWaste/Factsheets/Hospital.htm

Similarly, the trash contractor's hauling service could be transitioned from a regular schedule to "on-call" for the 35-yard compactor (i.e., custodial staff calls contractor once container capacity is reached). Based on August 2000 trash generation levels, this would save Shattuck an average of four hauls per month ($360) or 48 hauls per year ($4,300), equivalent to 8% of estimated costs incurred in 2000 for service of the 35-yard compactor.

- *Reinstitute corrugated cardboard recycling.* The major problem with the corrugated cardboard program was contamination with food waste. By proposing placement of corrugated cardboard bins in locations that are less prone to contamination with food and organic waste, and establishing further instruction and education, an RM contractor could help solve these types of issues that are normally not a priority to Shattuck because of their low cost relative to other operational expenses.

- *Include other paper grades in recycling program.* While the current vendor discourages newspaper and other low paper grades, it would be in an RM contractor's best interests to capture this material despite its low market value. Under an RM contract, each ton recycled (regardless of paper grade) represents profit-potential in the form of avoided disposal and haul cost, and possible commodity revenue. Moreover, the responsibility would be placed on the RM contractor to negotiate and obtain more favorable rates on trash service and recycled commodity revenues.

5. REALIZING COST EFFECTIVE RECYCLING AND REDUCTION POTENTIAL WITH RM CONTRACTING

In order to achieve the variety of cost-effective resource efficiencies described above, there are several standard practices that can be followed to prepare for and implement an RM contract (Table 5). Each of these stem from findings during the course of this and prior projects regarding: (a) the availability and use of information on current contract pricing structure, payments, and baseline waste management/recycling levels; (b) pre-bid information-gathering tactics, and (c) the nature of the incentives created by current contract pricing structures. Although the practices are somewhat interrelated, the first practice provides the foundation for implementing Practices 2-6.

Table 5: Summary of Standard RM Practices and Shattuck Implementation

RM Practice	Description	Present
1. Establish Baseline Cost, Performance and Service Levels	♦ Define scope and service levels ♦ Identify existing contract and compensation methods ♦ Establish cost and performance benchmarks and goals	
2. Seek Strategic Input from Contractors	♦ Convene pre-bid meetings with contractors to articulate goals and address questions ♦ Allow or require bidders to submit operations plans for achieving specified improvements in existing operations	
3. Align Waste and Resource Efficiency Services	♦ Coordinate, integrate, and formalize all contracts and services included in the baseline scope identified in Practice 1 ♦ Ensure that contractor has access to "internal" stakeholders that influence waste management and generation	
4. Establish Transparent Pricing for Services	♦ Delineate pricing information for specific services such as container maintenance, container rental, hauling, disposal, etc. ♦ Allow variable price savings, such as "avoided hauling and disposal" to flow back to generator and/or be used as means for financing performance bonuses.	X
5. Cap Compensation for Garbage Service	♦ Constrain waste hauling/disposal service compensation by capping or changing to "on-call service." ♦ De-couple contractor profitability from waste generation and/or service levels. ♦ Based initially on reasonable estimates of current hauling and disposal service and costs as per practice 1.	
6. Provide Direct Financial Incentives for Resource Efficiency	♦ Establish compensation that allows contractor to realize financial benefits for service improvements and innovations. ♦ Assess liquidated damages for failing to achieve minimum performance benchmarks or standards.	

Based on the practices identified above, an assessment was conducted to determine the extent to which RM practices were part of existing contracting at Shattuck. Those practices that are currently in place (Table 5) are RM practices that are the most mature or best established in Shattuck's current contracts and practices. There is potential for Shattuck to adopt remaining RM contracting practices to leverage recycling improvements as a cost neutral (or even cost saving) proposition.

1. *Establish baseline cost, performance, and service levels.* Shattuck's waste service level and cost is well established through monthly contractor invoicing with specific pricing and cost information for each date waste services are rendered. This information provides a clear and accurate picture of the potential to save large amounts on avoided waste service by increasing recycle rates and initiating source reduction activities. However, the service and cost levels for Shattuck's limited

recycling program are less well defined and documented, and mutual diversion benchmarks and goals have not been established by Shattuck and its contractor.

2. *Seek strategic input from prospective contractors.* RM contracting leads to a natural development of a strategic partnership since the contractor's profitability now rests in leveraging its expertise in cooperation with hospital staff to increase recycling and achieve waste reduction goals. Under its current contract, in which the recycling service has been handled by at least two sub-contractors as an add-on to trash service, there is a limited opportunity and incentive to create a partnership for recycling improvement.

3. *Align garbage, reduction and recycling services.* The paper recycling service was established as a peripheral contractual responsibility of the waste vendor. As a result, the trash contractor has handled recycling in an *ad hoc* way because it is not a core part of its business, does not drive its profitability, and is therefore not an emphasized component of the contract on an equal footing with trash service. One consequence of this is the undercapacity in recycling infrastructure and service within the hospital, which partially explains modest paper capture rates at Shattuck.

   Shattuck has been dissatisfied with the recycling contractor's lack of responsiveness to calls and inquiries, and lack of information on recycling tonnage, cost savings, or other useful data. An RM contract would bring recycling and source reduction from a marginal position to center stage by creating a profit motive for the contractor align itself with Shattuck's resource- and cost-efficiency objectives. For example, an RM contractor might de-emphasize disposal service and provide additional recycling bins and service, as suggested in section 3.

4. *Establish transparent pricing for services.* Shattuck has benefited from having its waste contractor "unbundle" pricing structures to specify hauling and disposal on a variable basis (i.e., $ per haul and $ per ton landfilled). This allows Shattuck to realize savings on the tonnage of materials disposed and the number of required hauls as suggested by the scenarios discussed in section 3 above. Furthermore, Shattuck could negotiate gain and risk-sharing arrangements on recycled commodities such as cardboard or compost. These would provide loss assurance in the form of shared costs between the contractor and Shattuck when commodity markets are weak, and in strong markets joint revenue. These dual savings could be used to finance performance bonuses and/or assess reasonable liquidated damages as described in practice 6.

5. *Cap compensation for disposal service.* Shattuck can effectively limit its trash contractor's ability to profit from ever-increasing garbage service levels by implementing on-call service for its trash compactors. This would allow the hospital to realize cost savings from having the contractor service the containers less frequently than for a scheduled pick-up arrangement. Looking ahead, Shattuck might use its baseline trash cost information to negotiate a cap on what it is willing to pay

for hauling/disposal service under an RM contract. This level would decrease gradually over time based on reasonable estimates of current and expected service.

6. *Provide direct financial incentives for resource efficiency*. Savings on avoided hauling and incineration fees and revenues received for recycled commodities (as established in practice 4) could, in part, finance a performance bonus for increased diversion (see Tables 3 and 4). Optimizing recycling involves providing the right incentives to all of the recycling program stakeholders (employees and departments, Shattuck environmental service staff, contractors), and revising these incentives as the limits of recycling are reached to further incentivize source reduction.

RM presents a timely opportunity for Shattuck to leverage cost-effective recycling and resource efficiency improvements by contractual means. The hospital is currently seeking to contract with a new paper recycling company, and is in the process of reassessing its other recycling options. Similarly, because Shattuck currently has a modest recycling rate, there is much "low-hanging fruit" and future opportunities for an RM contractor to profit from providing improved services (e.g., increased responsiveness and improved information reporting) and resource efficiency to the hospital.